

Disposable Catalysts for Coal Liquefaction

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The objective of DOE's Disposable Catalyst Program is to utilize the mineral matter in coal or other inexpensive naturally occurring ores as coal liquefaction catalysts which will substantially reduce hydrogen consumption and increase selectivity to liquids. Fundamental and applied research work performed in several laboratories has been coordinated into an integrated program. Research in the area of coal minerals has shown that pyrites and pyrrhotites are active and effective catalysts for the hydroliquefaction of coals exhibiting both hydrocracking and hydrogenation functionalities. Batch experiments have shown that pyrite or pyrrhotite addition improves coal conversion as well as product selectivity, i.e., a 5 wt% pyrite addition increases the conversion of coal to benzene solubles product equivalent to 25° C operating temperature increase and to distillate product equivalent to 20° C operating temperature increase.

Pyrites from various coals provide different levels of catalytic activity which are attributed to differences in morphologies of the pyrites and/or are related to different inherent surface area of the pyrites.

Pyrites from mineral deposits show in general lower catalytic activity than coal-extracted pyrites.

The catalytic role of coal mineral clays and their effect on the pyrite-pyrrhotite catalytic system is being studied.